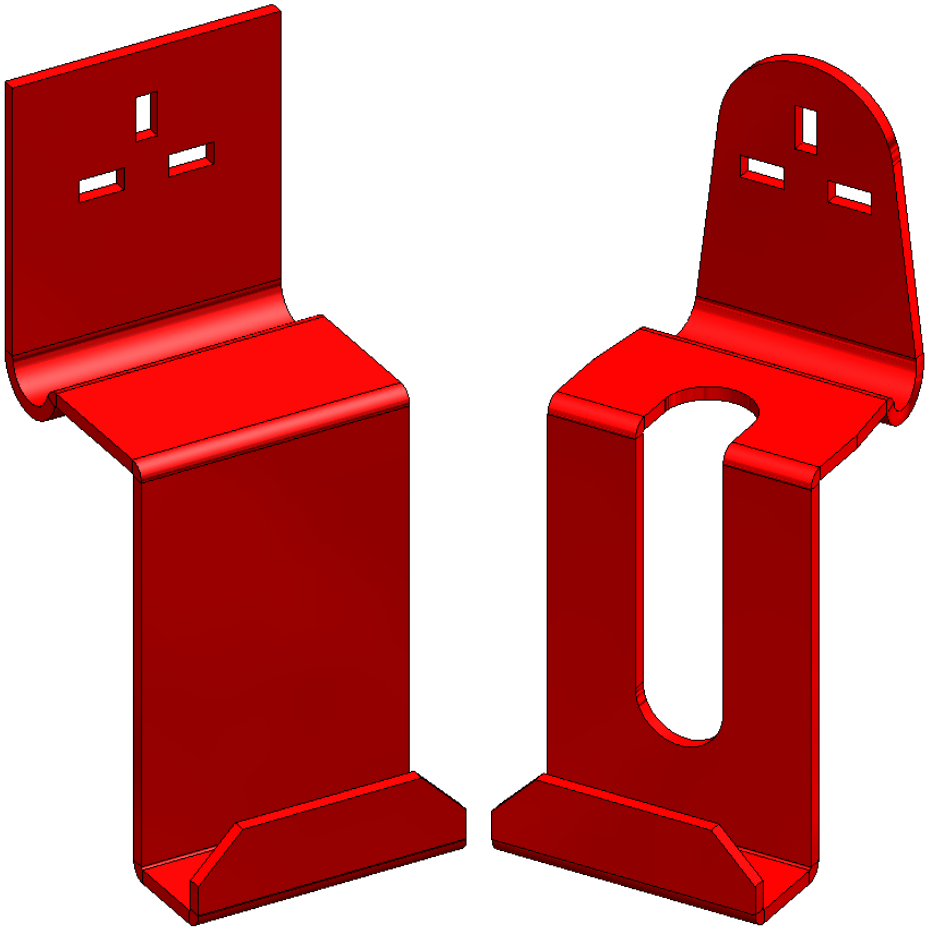
EXERCISE ONE:

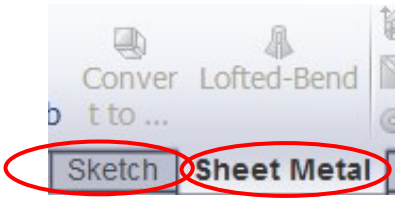
MOBILE PHONE HOLDER.



Prerequisite Knowledge	Previous knowledge of the following commands is required to complete this lesson; **Sketch (**Line, Centerline, Circle, Add Relations, Smart Dimension), **Sheet Metal tools** and **Edit Materials.**
Focus of lesson	A 3D model of a mobile phone holder as a sheet metal part and then may be unfolded to create additional features**.** With the **Unfold** and **Fold** tools, you can flatten and bend one, more than one, or all of the bends in a sheet metal part. This combination is useful when adding a cut across a bend.
Commands Used	This lesson includes Sketching, Base Flange**,** Flatten, Extruded Cut, Fold and Unfold.
New File	Create a new part file.
Save File	Save the file as '**Mobile Phone Holder'** to a folder called **'Phone holder'** (**Continue to save periodically throughout the exercise**)

Getting Started

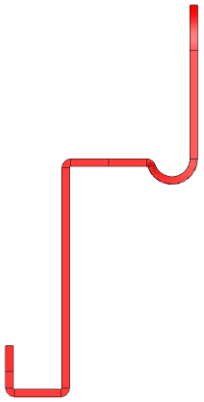
Activate Sketch and Sheet Metal tabs on the command manager as outlined in earlier exercises



Creating a sketch

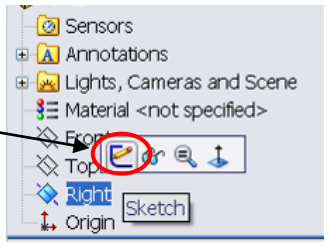
How do we start to model the mobile phone holder as a sheet metal part?

We will first create a open contour sketch based on a profile of the artefact



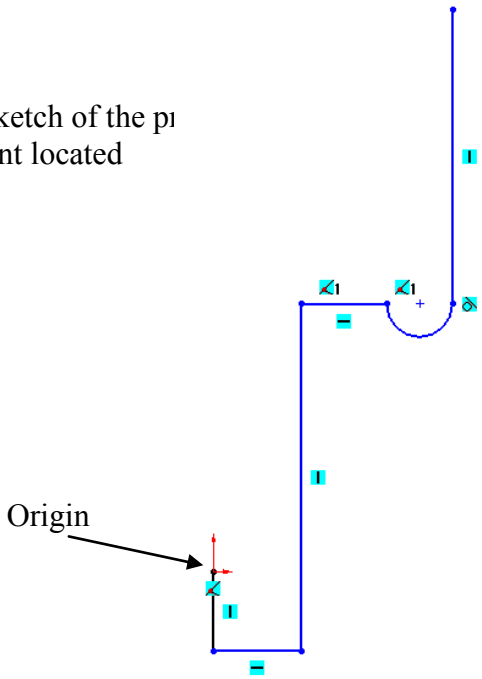
Choosing a plane

Choose the **Right plane** from the Design Tree and select the sketch icon from the heads up toolbar



Creating a sketch

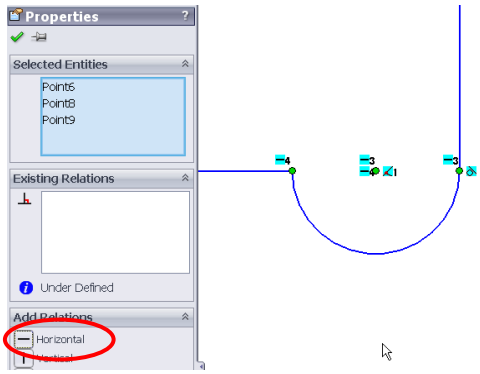
Select the **Line** command and create a sketch of the pı of the mobile phone holder with one point located on the origin as indicated.



As we are using the Right plane we are creating sketch of the end view of the model.

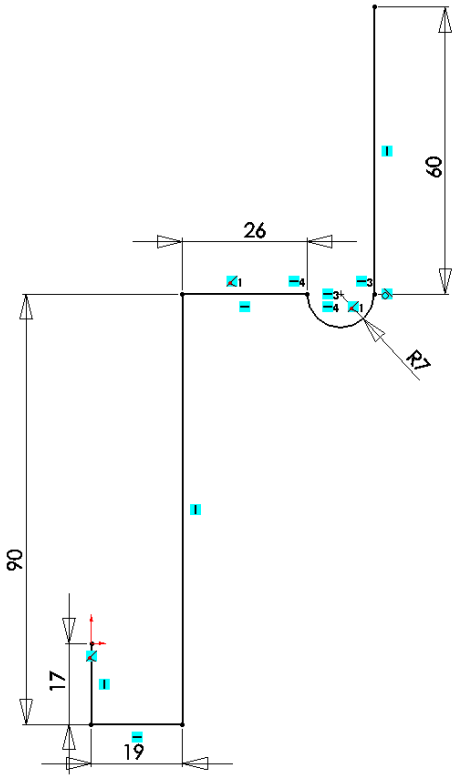
Adding relations

Select the three points indicated relating to the arc and apply a 'Horizontal' relation



Smart Dimension

Dimension the sketch as shown opposite



Always start with the smaller dimensions

Exit the sketch when fully defined

Creating the Sheet Metal Feature

Select Base Flange from the Sheet Metal toolbar

Select the sketch

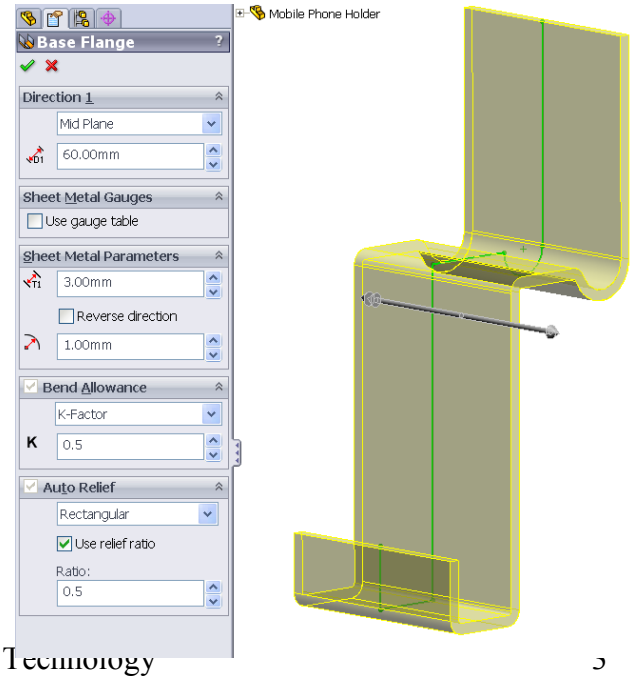
Choose 'Mid Plane' as the end condition for Direction 1

Insert 60mm as the width

Apply a thickness of 3mm

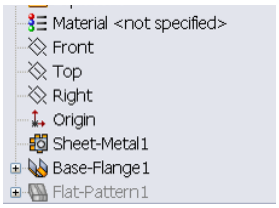
Apply a bend radius of 1mm

Select Ok



You will notice that three items are added to the design Tree:

- Sheet-Metal1 containing the properties of the part
- Base-Flange1 which is the feature just created
- Flat-Pattern1 which is suppressed

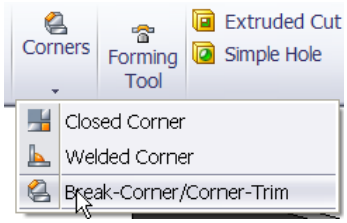


Rename Base Flange1

Rename this feature as '**Phone Holder**'

Chamfer Corners

Select 'Break-Corner/Corner Trim from the Sheet Metal toolbar

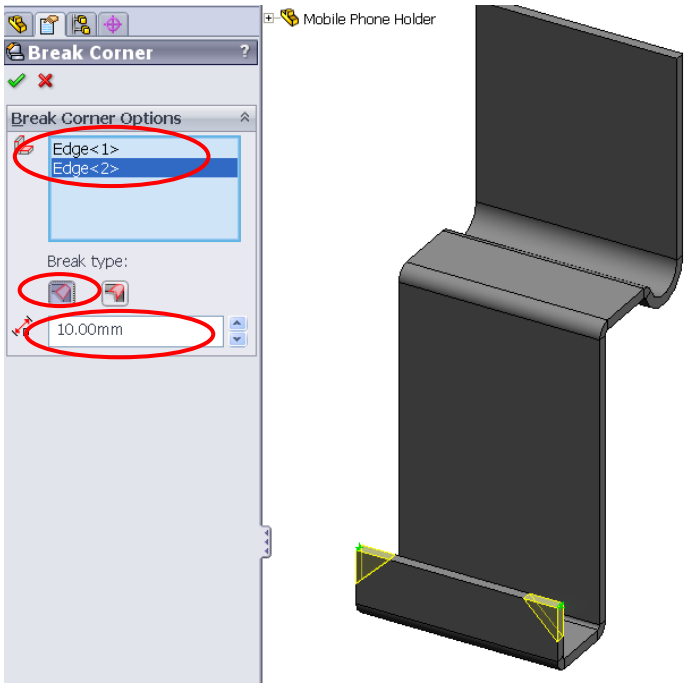


Select the appropriate Corners – Edge<1> and Edge<2>

Choose 'Chamfer' as the Break type

Apply a distance of 10mm

Select Ok

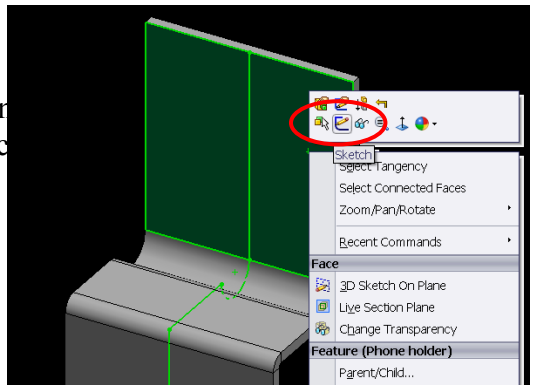


Rename feature

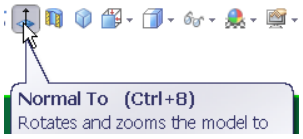
Rename this feature as 10mm chamfer

Sketching the Plug Holes

Right click the face as indicated. The chosen highlight in green as shown. Select the sketch from the heads up toolbar

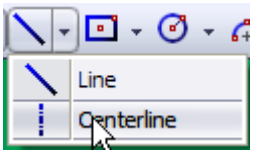


Select 'Normal to'



Creating the Sketch

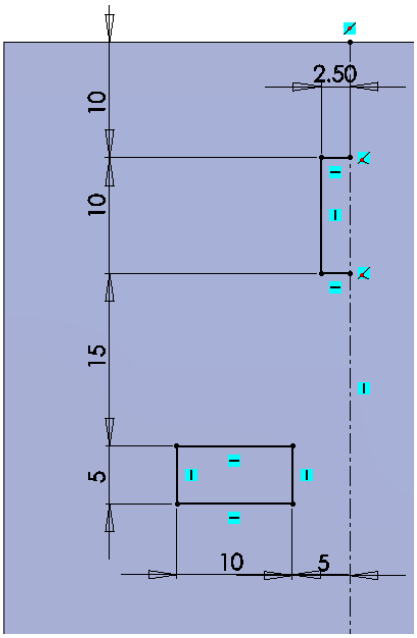
From the sketch toolbar select Centreline from the drop down menu of the line command.



Next move the cursor over the top edge. The centre of the edge will automatically be highlighted as shown. Left click on the point and draw a vertical line down the entire face as shown.

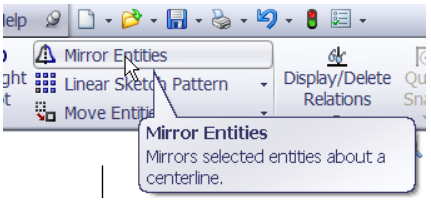
Next create a rough sketch of the plug holes using the 'Line' and 'Rectangle' commands as shown on one side of the centreline.

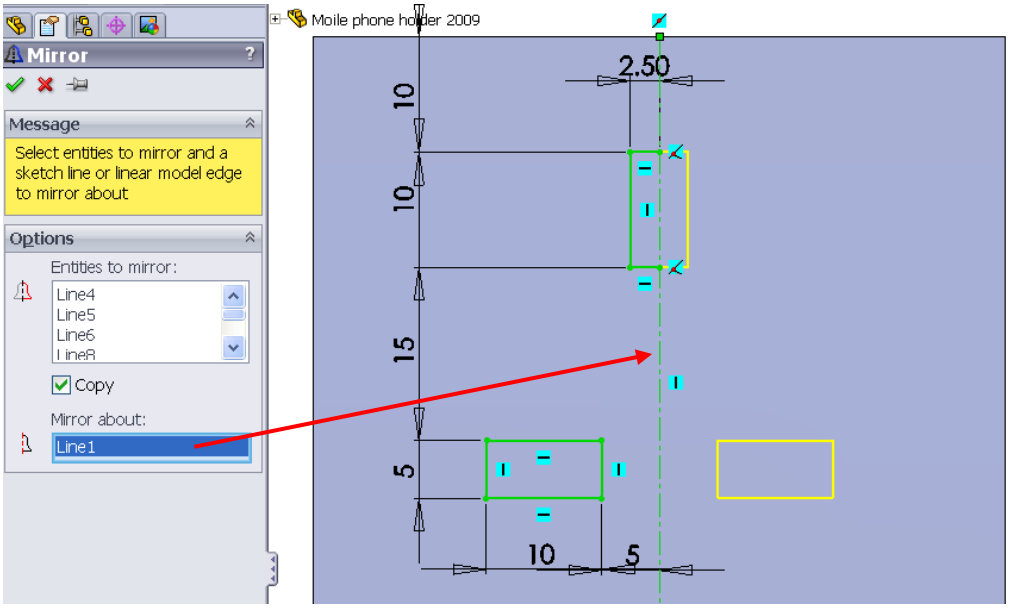
Smart Dimension as shown.



Mirror the Entities

Select 'Mirror Entities' from the sketch toolbar.



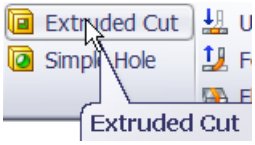


Select the lines to mirror. Mirror about the centreline of the face.

Exit the sketch.

Extruded Cut

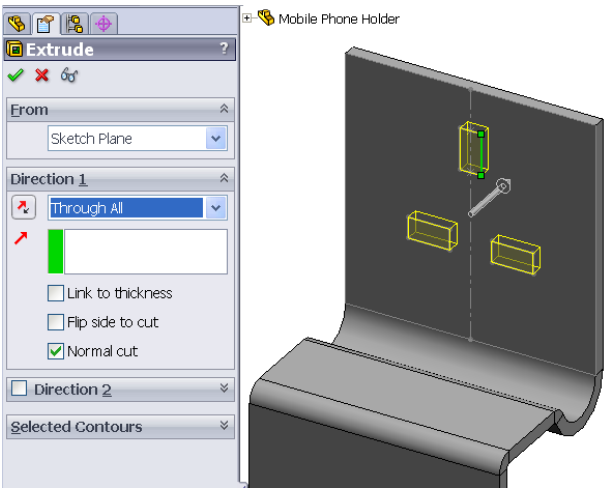
Select Extruded Cut from the sheet metal toolbar.



Select the previous sketch created

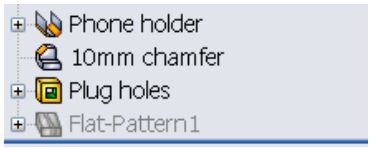
Choose ‘Through All’ as the end condition of ‘Direction 1’

Select Ok



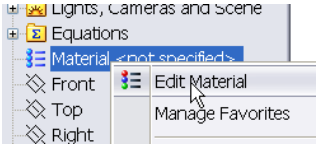
Rename feature

Rename feature as ‘Plug holes’.

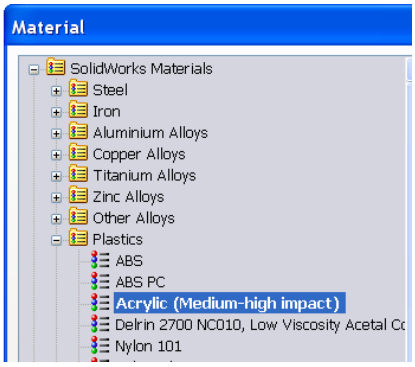


Edit Material

Right click on ‘Materials <not specified> in the Design Tree and select ‘Edit Material’



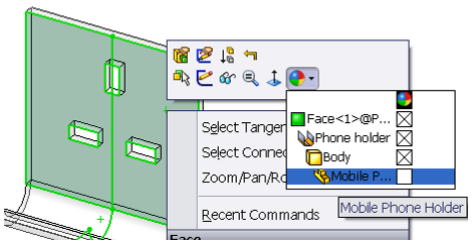
Scroll down to the ‘Plastics’ folder and select ‘Acrylic (Medium-high impact’ and choose ‘Apply’ and ‘Close’



Apply Colour

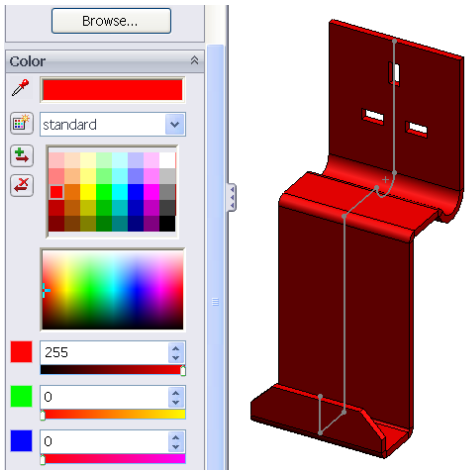
Right click on any face of the mobile phone holder

Select the Appearance icon and select the ‘Mobile Phone Holder’ part



Select a colour from the swatch in the Appearances Property Manager

Select Ok



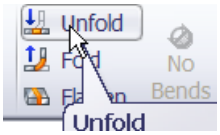
Unfold/Fold

Unfold can be used to flatten a model, allowing you to create sheet metal features which cross bend lines eg a hole or slot. **Fold** takes the unfolded model in the flattened state and refolds it.

Any feature created in the unfolded state will appear above the flat-pattern feature in the featuremanager design tree and hence will appear when the flat-pattern feature is suppressed.

Unfold

Select Unfold from the sheet metal toolbar *or* choose ***Insert, Sheet metal, Unfold…***



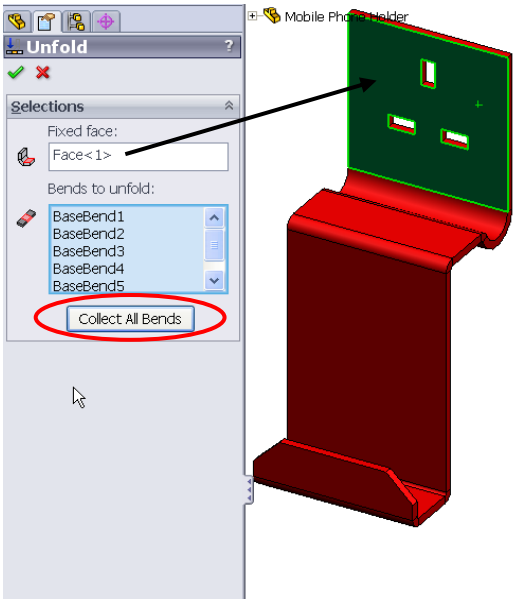
Choose the following options;

Fixed face: This will be the only surface which remains stationary. Choose the face as shown.

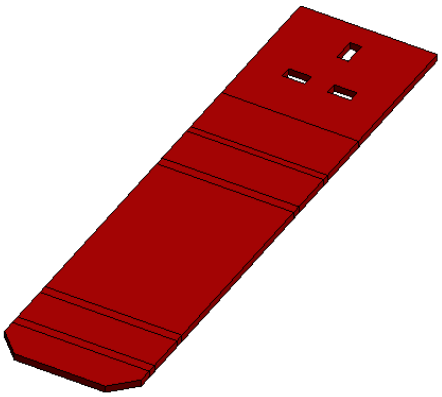
Bends to Unfold: These may be selected individually from the graphics area or choose all bends.
In this case we wish to unfold all the bends so we select **Collect All Bends.**

SolidWorks will automatically select all bends from the model.

Choose **OK**



The model is now unfolded. Notice how similar unfolding is to flattening. However, unfolding allows us to add sheet metal features and include them in the flat-pattern feature. Flattening does not allow us to do this.



Create a slotted feature

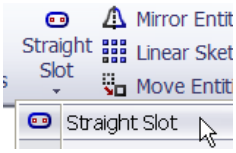
A number of slot types can be created depending on the requirements

- Straight Slot - sketch a straight slot using the two end points
- Centerpoint Straight Slot - sketch a straight slot from the center point
- 3 Point Arc Slot - sketch an arc slot using three points along the arc
- Centerpoint Arc Slot - sketch an arc slot using the center point of the arc and the two end points.

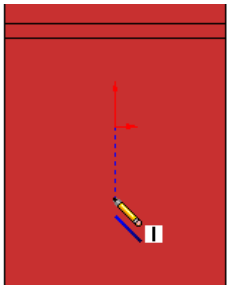
In this case we will create a straight slot

Right click on the face of the unfolded model and select the sketch icon.

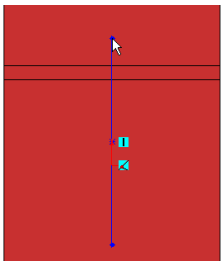
Select ‘Straight Slot’ from the sketch toolbar.



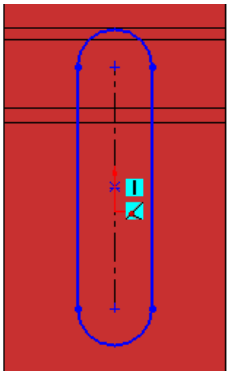
Start the sketch by clicking vertically below the origin to specify the starting point of the slot



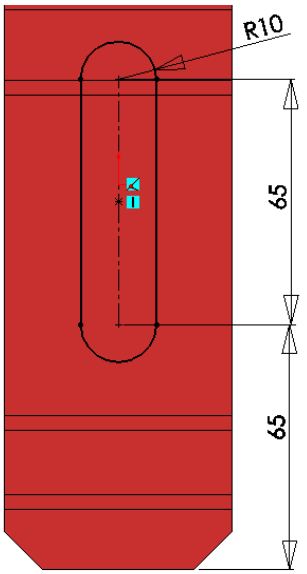
Move the cursor and then click to specify the approximate length of the slot



Move the cursor and then click to specify the width of the slot.



Smart dimension as shown



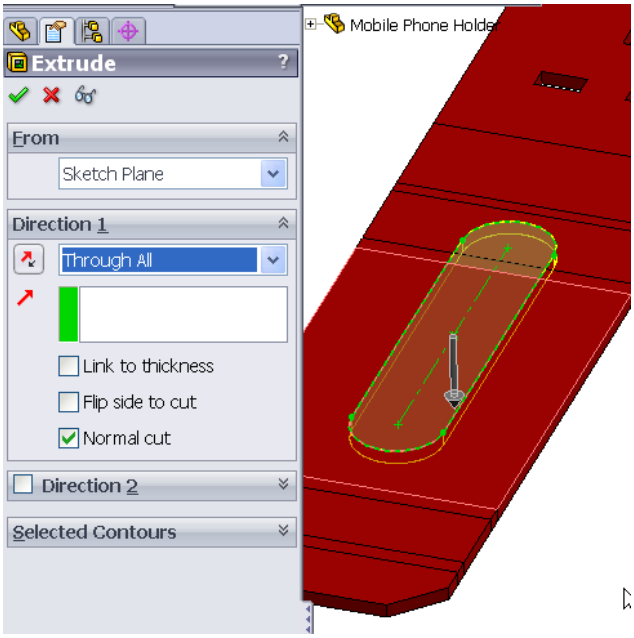
Extruded Cut

Select Extruded Cut from the Sheet metal toolbar

Select the sketch of the slot

Choose 'Through All' as the end condition of the feature

Choose Ok



Rename feature

Rename extruded cut feature as 'Slot'

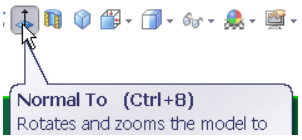
Shaping

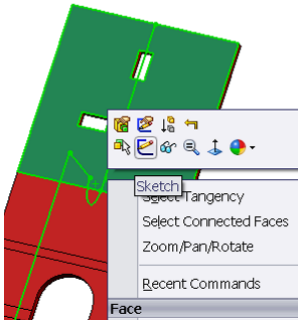
We will now shape the material across a number of the faces of the folder while it is in the unfolded position.

Sketch

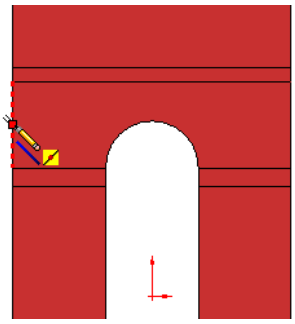
Right click on the front face of the unfolded holder and select the sketch icon

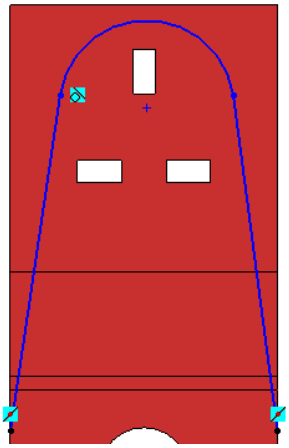
Choose 'Normal to' from the heads-up toolbar





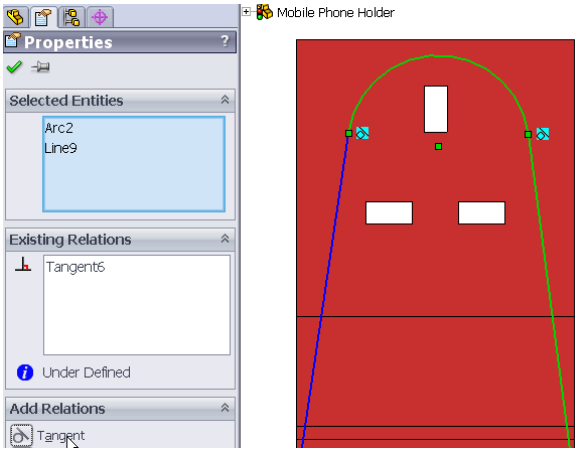
Using the line command, start the sketch on the midpoint of what will be the horizontal surface



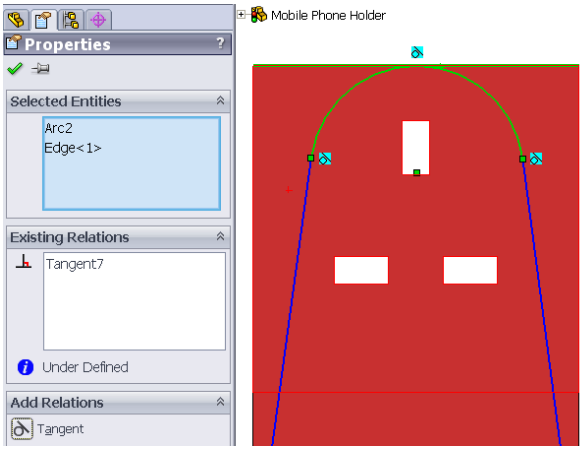


Create the sketch as shown

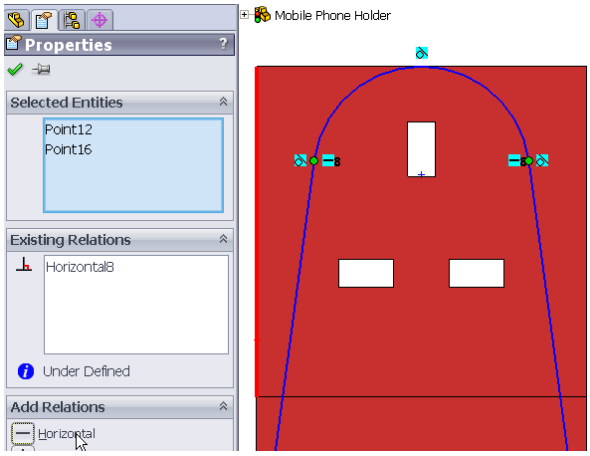
Add a 'Tangent' relation between the line and the arc



Add a 'Tangent' relation between the arc and the top edge of the material



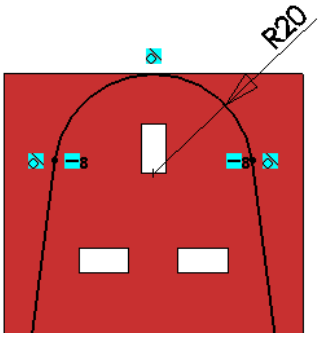
Add a ‘Horizontal’ relation between the two points of contact between the lines and the arc



Smart dimension the radius of the arc – 20mm

The sketch is now fully defined.

Exit the sketch

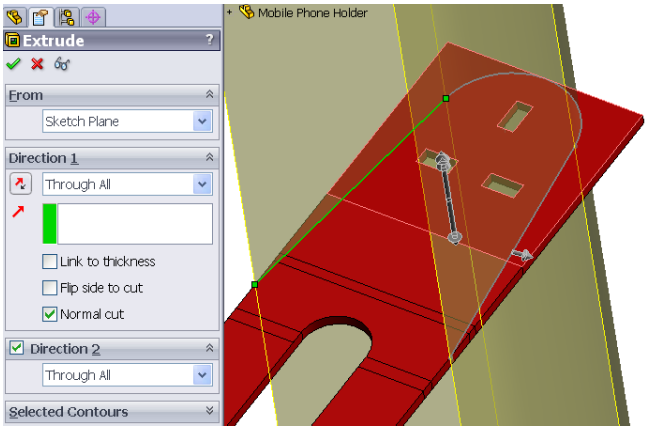


Extruded Cut

Select Extruded Cut from the Sheet metal toolbar

Select the sketch for the shaping

Choose Ok



Rename feature

Rename extruded cut feature as ‘Shaping’

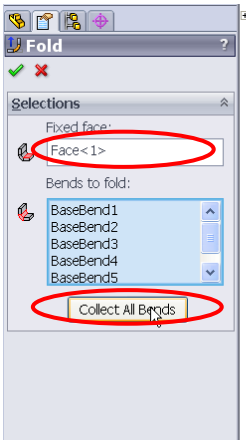
Fold

Now that the slot and shaping has been added to the mobile phone holder we can refold the object. Select **Fold** Fold from the sheet metal toolbar
or
Choose **Insert, Sheet metal, Fold** from the drop-down menu

Folding the holder follows a similar procedure to unfold it.

Fixed Face

By default SolidWorks chooses the same **fixed face**as was used to unfold the model. A different face may be chosen if you wish



Bends to fold

Choose **Collect All Bends**

The model will fold along the bend lines and the folded model will include the cut-out.

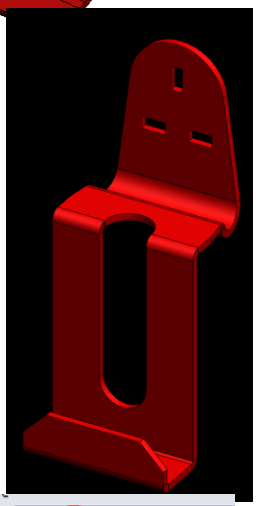
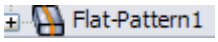


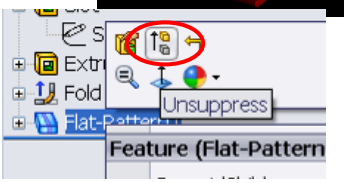
Image Quality

You can improve the image quality by going to Tools/Option/Document Properties/ Image Quality and move the slider to the right as in previous exercises

Flatten the model

Right click on the Flat-pattern feature and choose **Unsuppress**



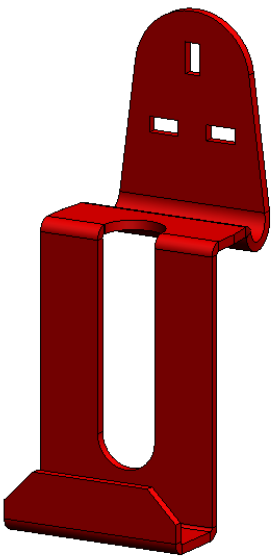


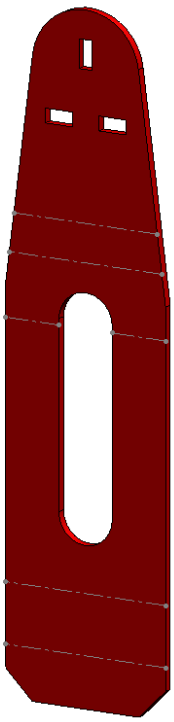
or

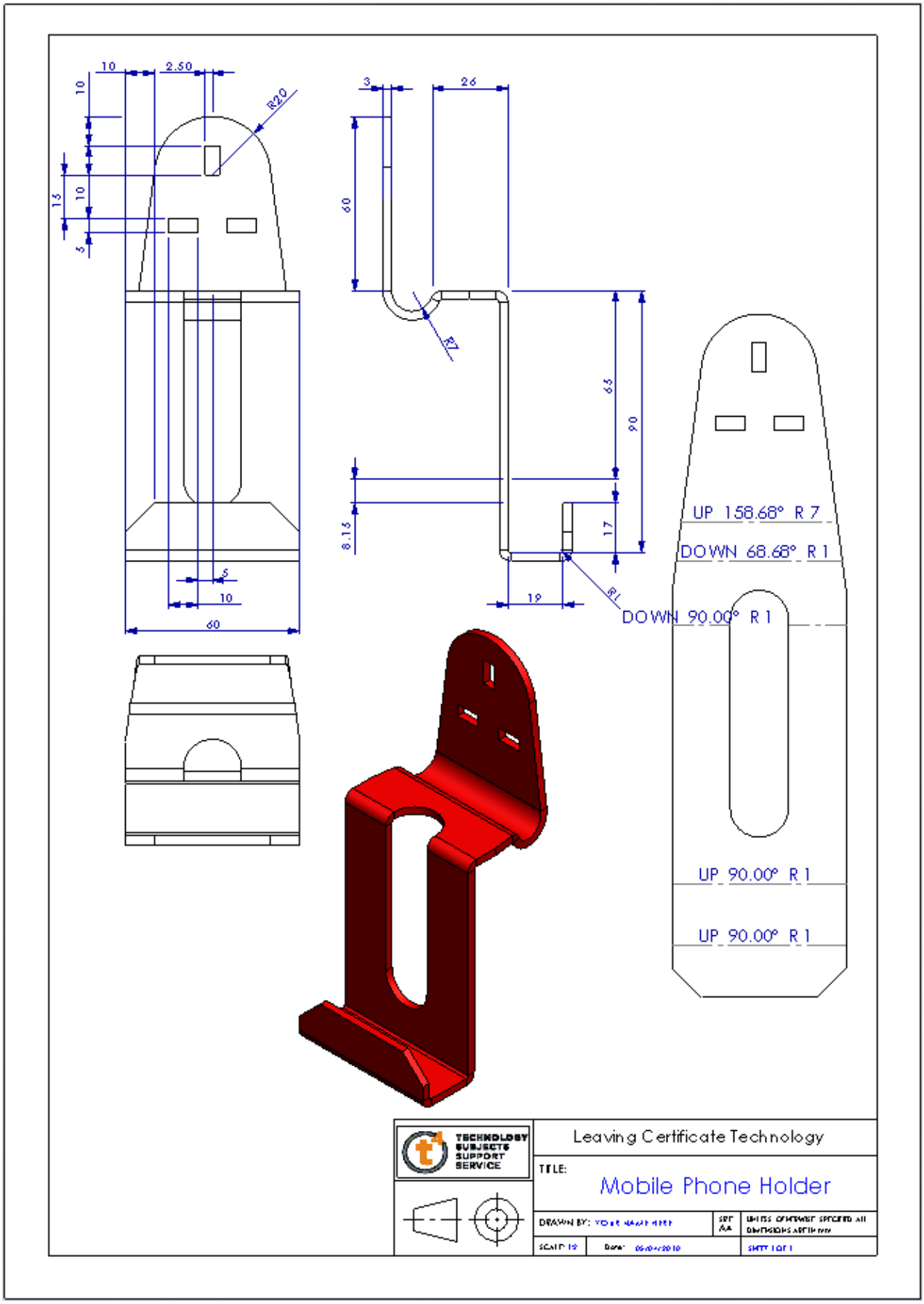
Choose ‘Flatten’ 

from the sheet metal toolbar

Note: This tool will both flatten and unflatten the model






10
2.50
10
R20
13
10
5
3
26
60
R7
65
90
8.15
17
19
R1
5
10
60
UP 158.68° R 7
DOWN 68.68° R 1
DOWN 90.00° R 1
UP 90.00° R 1
UP 90.00° R 1
TECHNOLOGY SUBJECTS SUPPORT SERVICE
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